APPLICATION CERTIFICATION FCC Part 15C
On Behalf of
Shenzhen Shi Niu Model Co., Ltd.

RC4WD 3-Channel 2.4GHz Transmitter

Model No.: Z-R0009

FCC ID: 2AUSC-ZR0009

Prepared for	:	Shenzhen Shi Niu Model Co., Ltd.
Address	:	3rd Floor, No. 26, Baolong Road, Dakang Community, Henggang, Longgang District, Shenzhen, Guangdong, China
Prepared by	:	Shenzhen Accurate Technology Co., Ltd.
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Report No.	:	ATE20191471
Date of Test	:	Oct. 09, 2019-Oct. 11, 2019
Date of Report	:	Oct. 22, 2019

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Test Report Certification

Applicant	:	Shenzhen Shi Niu Model Co., Ltd.
Address	:	3rd Floor, No. 26, Baolong Road, Dakang Community, Henggang, Longgang District, Shenzhen, Guangdong, China
Manufacturer	:	Shenzhen Shi Niu Model Co., Ltd.
Address	:	3rd Floor, No. 26, Baolong Road, Dakang Community, Henggang, Longgang District, Shenzhen, Guangdong, China
Product	:	RC4WD 3-Channel 2.4GHz Transmitter
Model No.	:	Z-R0009
Trade name	:	RC4WD

Measurement Procedure Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.247
ANSI C63.10: 2013

The EUT was tested according to DTS test procedure of April 02, 2019 KDB558074 D01 DTS Meas Guidance v05r02 for compliance to FCC 47CFR 15.247 requirements.

The device described above is tested by Shenzhen Accurate Technology Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C Section 15.247 limits. The measurement results are contained in this test report and Shenzhen Accurate Technology Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of Shenzhen Accurate Technology Co., Ltd.

Date of Test :	Oct. 09, 2019-Oct. 11, 2019
Date of Report:	Oct. 22, 2019
Prepared by :	(Tim Zhang, Engineer)
Approved & Authorized Signer :	(Sean Liu, Manager)

1. GENERAL INFORMATION

1.1.Description of Device (EUT)

EUT	:	RC4WD 3-Channel 2.4GHz Transmitter
Model Number	:	Z-R0009
Hardware version	:	V1.0
Software version	:	V1.0
Frequency Range	:	2405MHz-2478MHz
Number of Channels	:	74
Antenna Gain	:	2.5dBi
Antenna type	:	Integral Antenna
Power Supply	:	DC 6V
Modulation mode	:	GFSK
Applicant	:	Shenzhen Shi Niu Model Co., Ltd.
Address	:	3rd Floor, No. 26, Baolong Road, Dakang Community, Henggang, Longgang District, Shenzhen, Guangdong, China
Manufacturer	:	Shenzhen Shi Niu Model Co., Ltd.
Address	:	3rd Floor, No. 26, Baolong Road, Dakang Community, Henggang, Longgang District, Shenzhen, Guangdong, China
Date of sample received	:	Oct. 08, 2019
Date of Test	:	Oct. 09, 2019-Oct. 11, 2019
Sample Number	:	1901235

1.2.Carrier Frequency of Channels

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channe l	Frequency (MHz)
1	2405	20	2424	39	2443	58	2462
2	2406	21	2425	40	2444	59	2463
3	2407	22	2426	41	2445	60	2464
4	2408	23	2427	42	2446	61	2465
5	2409	24	2428	43	2447	62	2466
6	2410	25	2429	44	2448	63	2467
7	2411	26	2430	45	2449	64	2468
8	2412	27	2431	46	2450	65	2469
9	2413	28	2432	47	2451	66	2470
10	2414	29	2433	48	2452	67	2471
11	2415	30	2434	49	2453	68	2472
12	2416	31	2435	50	2454	69	2473
13	2417	32	2436	51	2455	70	2474
14	2418	33	2437	52	2456	71	2475
15	2419	34	2438	53	2457	72	2476
16	2420	35	2439	54	2458	73	2477
17	2421	36	2440	55	2459	74	2478
18	2422	37	2441	56	2460		
19	2423	38	2442	57	2461		

1.3.Special Accessory and Auxiliary Equipment

N/A

1.4.Description of Test Facility

EMC Lab	:	Recognition of accreditation by Federal Communications Commission (FCC) The Designation Number is CN1189 The Registration Number is 708358 Listed by Innovation, Science and Economic Development Canada (ISEDC) The Registration Number is 5077A-2 Accredited by China National Accreditation Service for Conformity Assessment (CNAS) The Registration Number is CNAS L3193 Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 4297.01
Name of Firm	:	Shenzhen Accurate Technology Co., Ltd.
Site Location	:	1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China

1.5.Measurement Uncertainty

Conducted Emission Expanded Uncertainty (Mains ports, 9kHz-30MHz)	=	2.72dB, k=2
Radiated emission expanded uncertainty (9kHz-30MHz)	=	2.66dB, k=2
Radiated emission expanded uncertainty (30MHz-1000MHz)	=	4.28dB, k=2
Radiated emission expanded uncertainty (1G-18GHz)	=	4.98dB, k=2
Radiated emission expanded uncertainty (18G-26.5GHz)	=	5.06dB, k=2

2. MEASURING DEVICE AND TEST EQUIPMENT

2.1.For Radiated Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analyzer	Agilent	E7405A	MY45115511	Jan.05, 2019	1 Year
2.	Spectrum Analyzer	Rohde&Schwarz	FSV40	101495	Jan.05, 2019	1 Year
3.	Test Receiver	Rohde&Schwarz	ESCS30	100307	Jan.05, 2019	1 Year
4.	Test Receiver	Rohde& Schwarz	ESPI	100396/003	Jan.05, 2019	1 Year
5.	Test Receiver	Rohde& Schwarz	ESPI	101526/003	Jan.05, 2019	1 Year
6.	Test Receiver	Rohde& Schwarz	ESR	101817	Jan.05, 2019	1 Year
7.	Bilog Antenna	Schwarzbeck	VULB9163	9163-194	Jan.05, 2019	1 Year
8.	Bilog Antenna	Schwarzbeck	VULB9163	9163-323	Jan.05, 2019	1 Year
9.	Log.-Per.Antenna	Schwarzbeck	VUSLP 9111B	9111B-074	Jan.05, 2019	1 Year
10.	Biconical Broad Band Antenna	Schwarzbeck	VHBB 9124+BBA 9106	9124-617	Jan.05, 2019	1 Year
11.	Loop Antenna	Schwarzbeck	FMZB1516	1516131	Jan.05, 2019	1 Year
12.	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-655	Jan.05, 2019	1 Year
13.	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1067	Jan.05, 2019	1 Year
14.	Vertical Active Monopole Antenna	Schwarzbeck	VAMP 9243	9243-370	Jan.05, 2019	1 Year
15.	RF Switching Unit+PreAMP	Compliance Direction	RSU-M2	38322	Jan.05, 2019	1 Year
16.	Pre-Amplifier	Agilent	8447D	294A10619	Jan.05, 2019	1 Year
17.	Pre-Amplifier	Rohde&Schwarz	CBLU11835 40-01	3791	Jan.05, 2019	1 Year
18.	50 Coaxial Switch	Anritsu Corp	MP59B	6200237248	Jan.05, 2019	1 Year
19.	50 Coaxial Switch	Anritsu Corp	MP59B	6200506474	Jan.05, 2019	1 Year
20.	RF Coaxial Cable	Schwarzbeck	N-5m	No.1	Jan.05, 2019	1 Year
21.	RF Coaxial Cable	Schwarzbeck	N-1m	No.6	Jan.05, 2019	1 Year
22.	RF Coaxial Cable	Schwarzbeck	N-1m	No.7	Jan.05, 2019	1 Year
23.	RF Coaxial Cable	SUHNER	N-3m	No.8	Jan.05, 2019	1 Year
24.	RF Coaxial Cable	RESENBERGER	N-3.5m	No.9	Jan.05, 2019	1 Year
25.	RF Coaxial Cable	SUHNER	N-6m	No.10	Jan.05, 2019	1 Year
26.	RF Coaxial Cable	RESENBERGER	N-12m	No.11	Jan.05, 2019	1 Year
27.	RF Coaxial Cable	RESENBERGER	N-0.5m	No.12	Jan.05, 2019	1 Year
28.	RF Coaxial Cable	SUHNER	N-2m	No.13	Jan.05, 2019	1 Year
29.	RF Coaxial Cable	SUHNER	N-0.5m	No.15	Jan.05, 2019	1 Year
30.	RF Coaxial Cable	SUHNER	N-2m	No.16	Jan.05, 2019	1 Year
31.	RF Coaxial Cable	RESENBERGER	N-6m	No.17	Jan.05, 2019	1 Year
Radiated Emission Measurement Software: EZ_EMC V1.1.4.2						

3. OPERATION OF EUT DURING TESTING

3.1.Operating Mode

The mode is used: **Transmitting mode**

Low Channel: 2405MHz
Middle Channel: 2441MHz
High Channel: 2478MHz

3.2.Configuration and peripherals

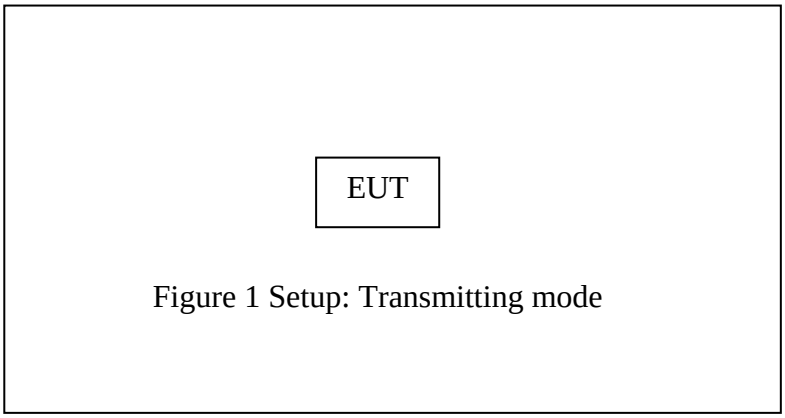


Figure 1 Setup: Transmitting mode

(EUT: RC4WD 3-Channel 2.4GHz Transmitter)

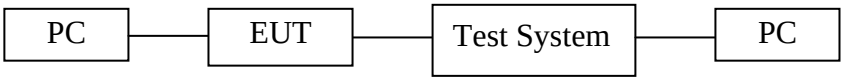
4. TEST PROCEDURES AND RESULTS

FCC Rules	Description of Test	Result
Section 15.247(a)(2)	6dB Bandwidth Test	Compliant
Section 15.247(e)	Power Spectral Density Test	Compliant
Section 15.247(b)(3)	Maximum Peak Output Power Test	Compliant
Section 15.247(d)	Band Edge Compliance Test	Compliant
Section 15.247(d) Section 15.209	Radiated Spurious Emission Test	Compliant
Section 15.247(d)	Conducted Spurious Emission Test	Compliant
Section 15.207	AC Power Line Conducted Emission Test	N/A
Section 15.203	Antenna Requirement	Compliant

Note: The power supply mode of the EUT is DC 6V, According to the FCC standard's requirements, conducted emission is not applicable.

5. 6DB BANDWIDTH MEASUREMENT

5.1.Block Diagram of Test Setup



(EUT: RC4WD 3-Channel 2.4GHz Transmitter)

5.2.The Requirement For Section 15.247(a)(2)

Section 15.247(a)(2): Systems using digital modulation techniques may operate in the 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

5.3.EUT Configuration on Measurement

The equipment is installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

5.4.Operating Condition of EUT

5.4.1.Setup the EUT and simulator as shown as Section 5.1.

5.4.2.Turn on the power of all equipment.

5.4.3.Let the EUT work in TX modes measure it. The transmit frequency range is 2405-2478MHz. We select 2405MHz, 2441MHz, and 2478MHz TX frequency to transmit.

5.5.Test Procedure

5.5.1.The transmitter output was connected to the spectrum analyzer through a low loss cable.

5.5.2.Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz.

5.5.3.The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

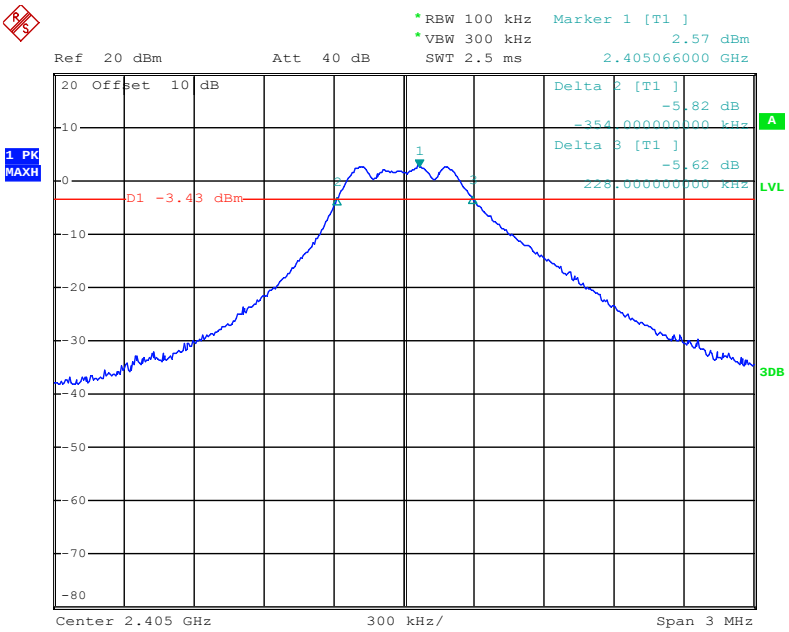
5.6.Test Result

The test data of EUT:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit(MHz)	PASS/FAIL
1	2405	0.582	0.5	PASS
37	2441	0.582	0.5	PASS
74	2478	0.570	0.5	PASS

The spectrum analyzer plots are attached as below.

channel 1



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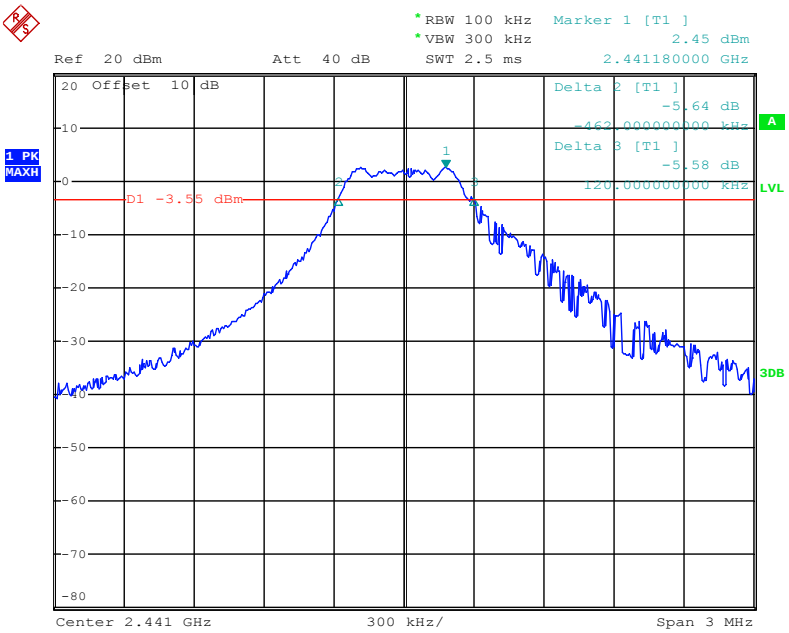
channel 37



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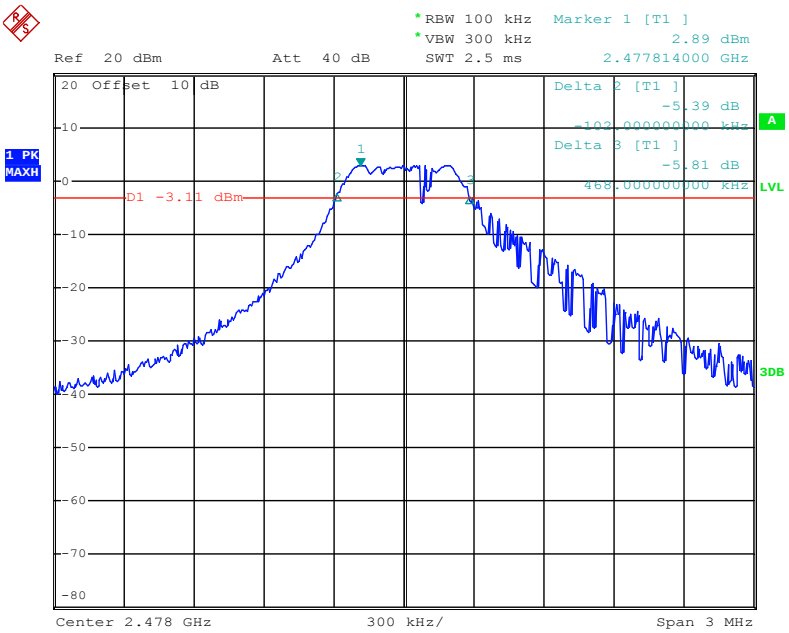
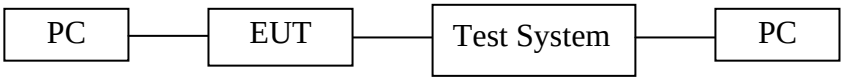
channel 74



Date: 11.OCT.2019 23:49:08

6. MAXIMUM PEAK OUTPUT POWER

6.1.Block Diagram of Test Setup



(EUT: RC4WD 3-Channel 2.4GHz Transmitter)

6.2.The Requirement For Section 15.247(b)(3)

Section 15.247(b)(3): For systems using digital modulation in the 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz bands: 1 Watt.

6.3.EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

6.4.Operating Condition of EUT

6.4.1.Setup the EUT and simulator as shown as Section 6.1.

6.4.2.Turn on the power of all equipment.

6.4.3.Let the EUT work in TX modes measure it. The transmit frequency range is 2405-2478MHz. We select 2405MHz, 2441MHz, and 2478MHz TX frequency to transmit.

6.5.Test Procedure

6.5.1.The transmitter output was connected to the spectrum analyzer through a low loss cable.

6.5.2.Set RBW of spectrum analyzer to 1 MHz and VBW to 3 MHz.

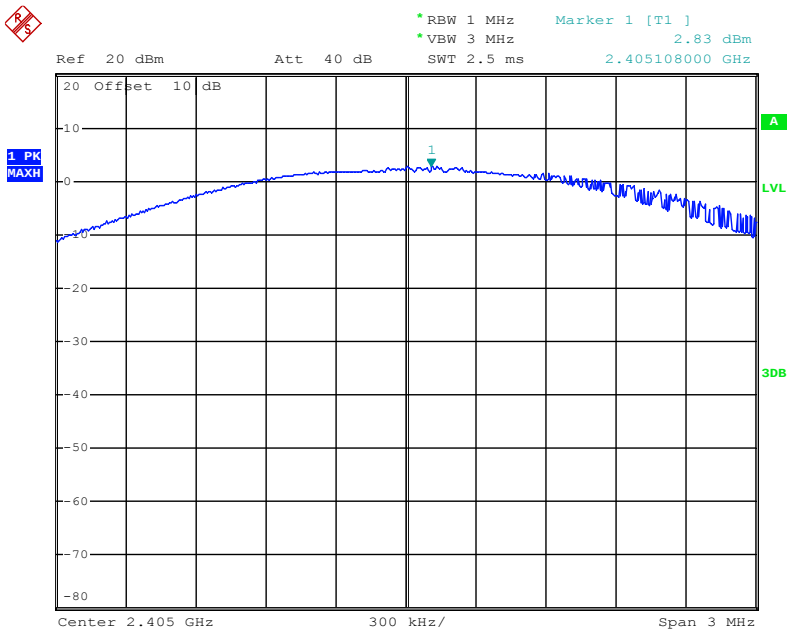
6.5.3.Measurement the maximum peak output power.

6.6.Test Result

Channel	Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass / Fail
1	2405	2.83	30	PASS
37	2441	3.90	30	PASS
74	2478	4.21	30	PASS

The spectrum analyzer plots are attached as below.

channel 1



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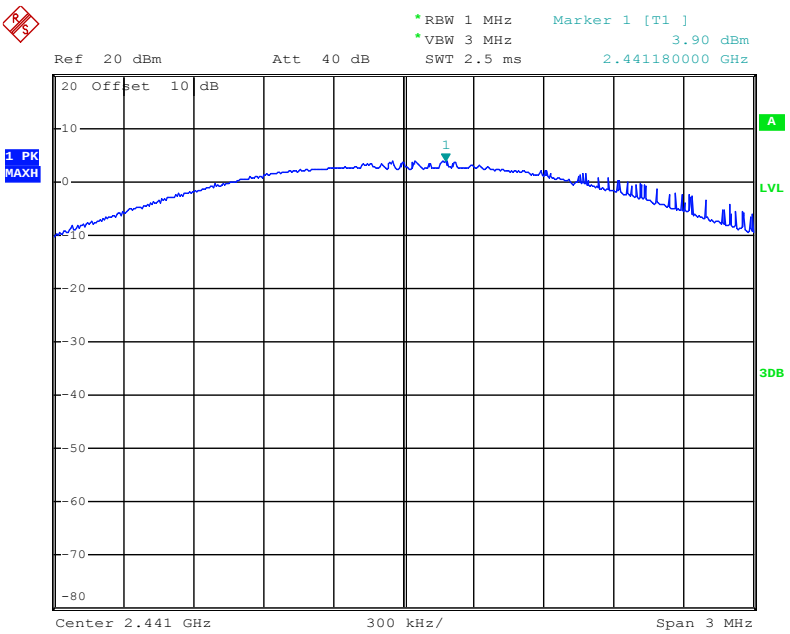
channel 37



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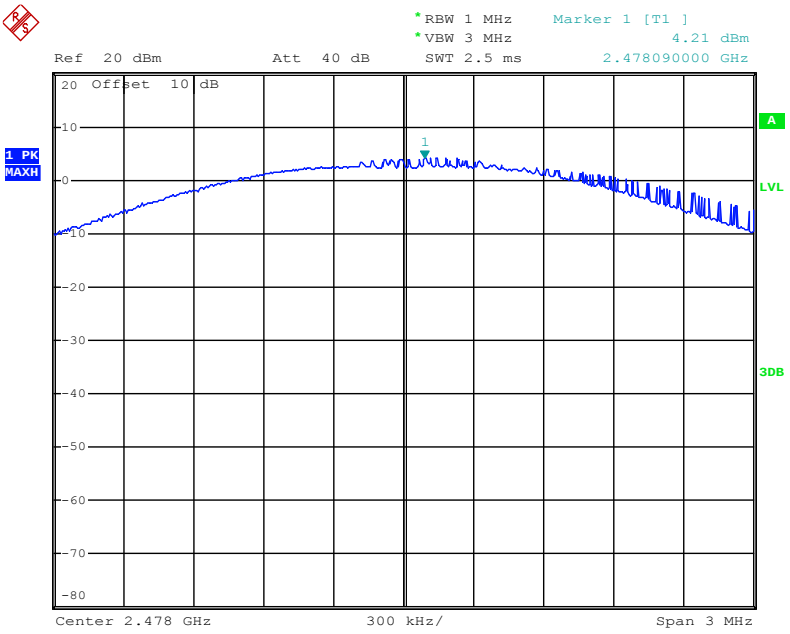
channel 74



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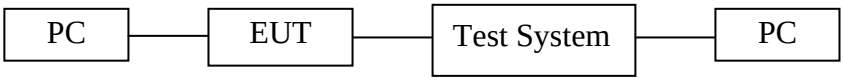
7. POWER SPECTRAL DENSITY MEASUREMENT

7.1.Block Diagram of Test Setup



(EUT: RC4WD 3-Channel 2.4GHz Transmitter)

7.2.The Requirement For Section 15.247(e)

Section 15.247(e): For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

7.3.EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

7.4.Operating Condition of EUT

7.4.1.Setup the EUT and simulator as shown as Section 7.1.

7.4.2.Turn on the power of all equipment.

7.4.3.Let the EUT work in TX modes measure it. The transmit frequency range is 2405-2478MHz. We select 2405MHz, 2441MHz, and 2478MHz TX frequency to transmit.

7.5. Test Procedure

7.5.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.

7.5.2. Measurement Procedure PKPSD:

7.5.3. This procedure must be used if maximum peak conducted output power was used to demonstrate compliance to the fundamental output power limit, and is optional if the maximum (average) conducted output power was used to demonstrate compliance.

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
4. Set the VBW ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3kHz) and repeat.

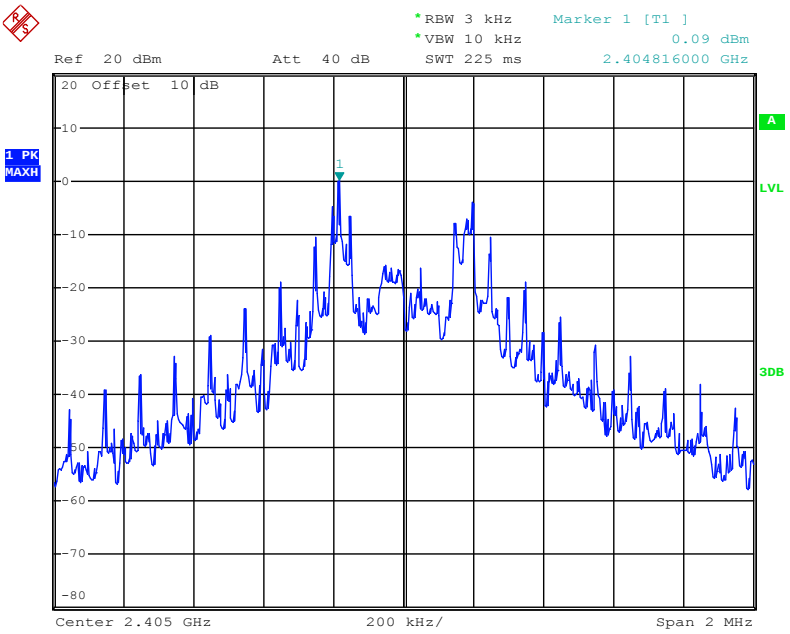
7.5.4. Measurement the maximum power spectral density.

7.6.Test Result

CHANNEL NUMBER	FREQUENCY (MHz)	PSD (dBm/3KHz)	LIMIT (dBm/3KHz)	PASS/FAIL
1	2405	0.09	8	PASS
37	2441	1.95	8	PASS
74	2478	2.74	8	PASS

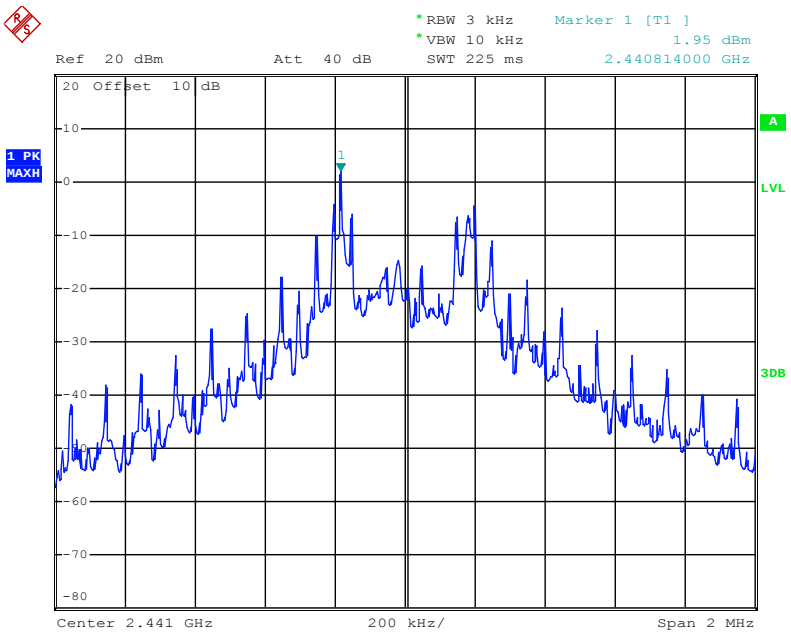
The spectrum analyzer plots are attached as below.

channel 1



Date: 11.OCT.2019 23:55:54

channel 37



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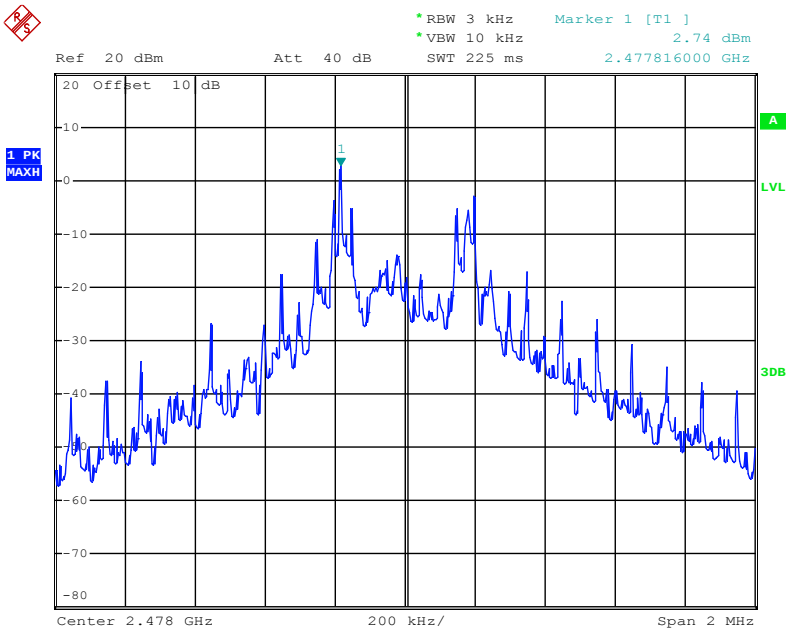
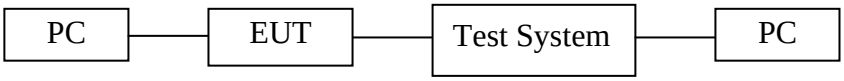
channel 74



Date: 11.OCT.2019 23:55:11

8. BAND EDGE COMPLIANCE TEST

8.1.Block Diagram of Test Setup



(EUT: RC4WD 3-Channel 2.4GHz Transmitter)

8.2.The Requirement For Section 15.247(d)

Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

8.3.EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

8.4.Operating Condition of EUT

8.4.1.Setup the EUT and simulator as shown as Section 8.1.

8.4.2.Turn on the power of all equipment.

8.4.3.Let the EUT work in TX modes measure it. The transmit frequency range is 2405-2478MHz. We select 2405MHz, 2478MHz TX frequency to transmit.

8.5.Test Procedure

Conducted Band Edge:

8.5.1.The transmitter output was connected to the spectrum analyzer via a low loss cable.

8.5.2.Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz.

8.5.3. Radiate Band Edge:

8.5.4.The EUT is placed on a turntable, which is 0.1m above the ground plane and worked at highest radiated power.

8.5.5.The turntable was rotated for 360 degrees to determine the position of maximum emission level.

8.5.6.EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.

8.5.7.Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:

8.5.8.RBW=1MHz, VBW=1MHz

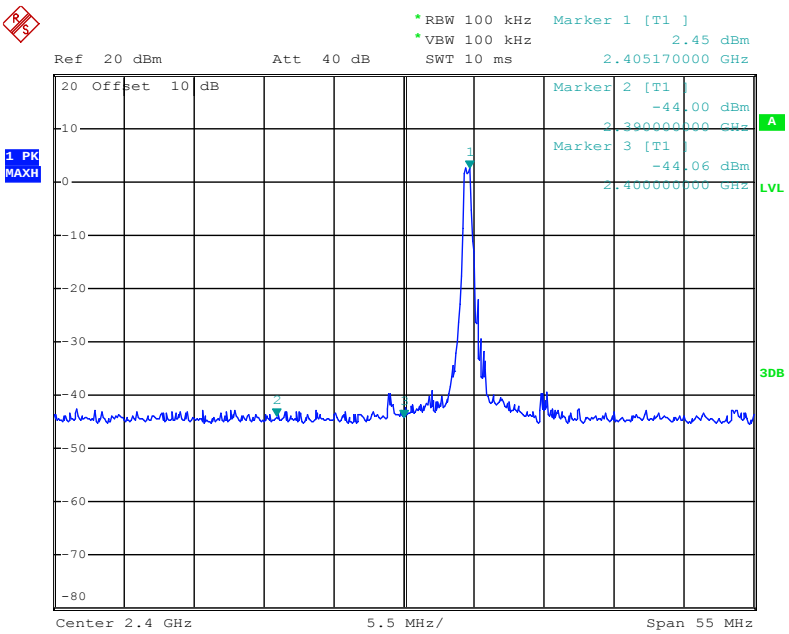
8.5.9.The band edges was measured and recorded.

8.6.Test Result

Pass

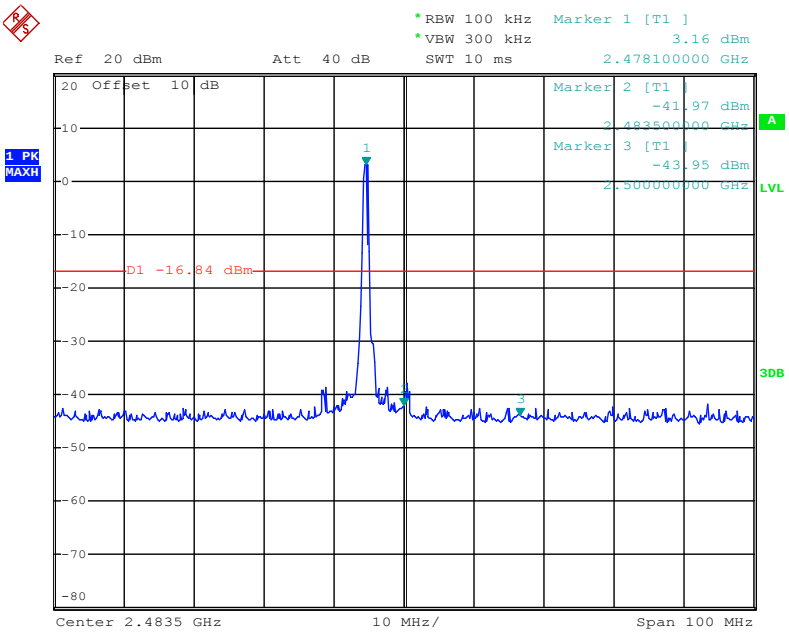
Frequency	Delta peak to band emission	Limit(dBc)
2.4GHz	46.51	20
2.4835GHz	45.13	20

channel 1



Date: 11.OCT.2019 00:05:25

channel 74



Date: 11.OCT.2019 00:01:17

Radiated Band Edge Result

ACCURATE TECHNOLOGY CO., LTD.
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Site: 1# Chamber
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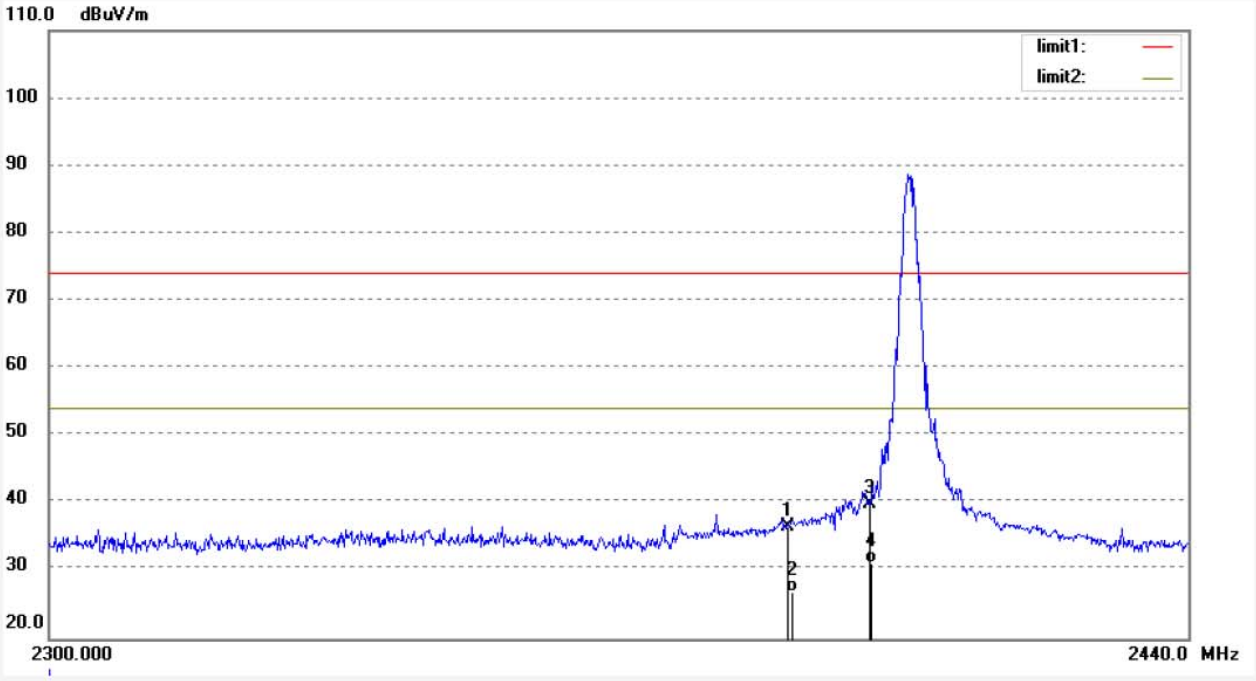
Fax:+86-0755-26503396

Job No.: FRANK2019 #1599	Polarization: Horizontal
Standard: FCC PK	Power Source: DC 6V
Test item: Radiation Test	Date: 19/10/09/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 9/49/14
EUT: RC4WD 3-Channel 2.4GHz Transmitter	Engineer Signature:
Mode: TX 2405MHz	Distance: 3m
Model: Z-R0009	
Manufacturer: Shenzhen Shi Niu Model Co., Ltd.	

Note: Report NO.:ATE20191471



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2390.000	42.97	-6.32	36.65	74.00	-37.35	peak	200	325	
2	2390.000	33.16	-6.32	26.84	54.00	-27.16	AVG	200	93	
3	2400.000	46.12	-6.27	39.85	74.00	-34.15	peak	200	159	
4	2400.000	37.42	-6.27	31.15	54.00	-22.85	AVG	200	17	

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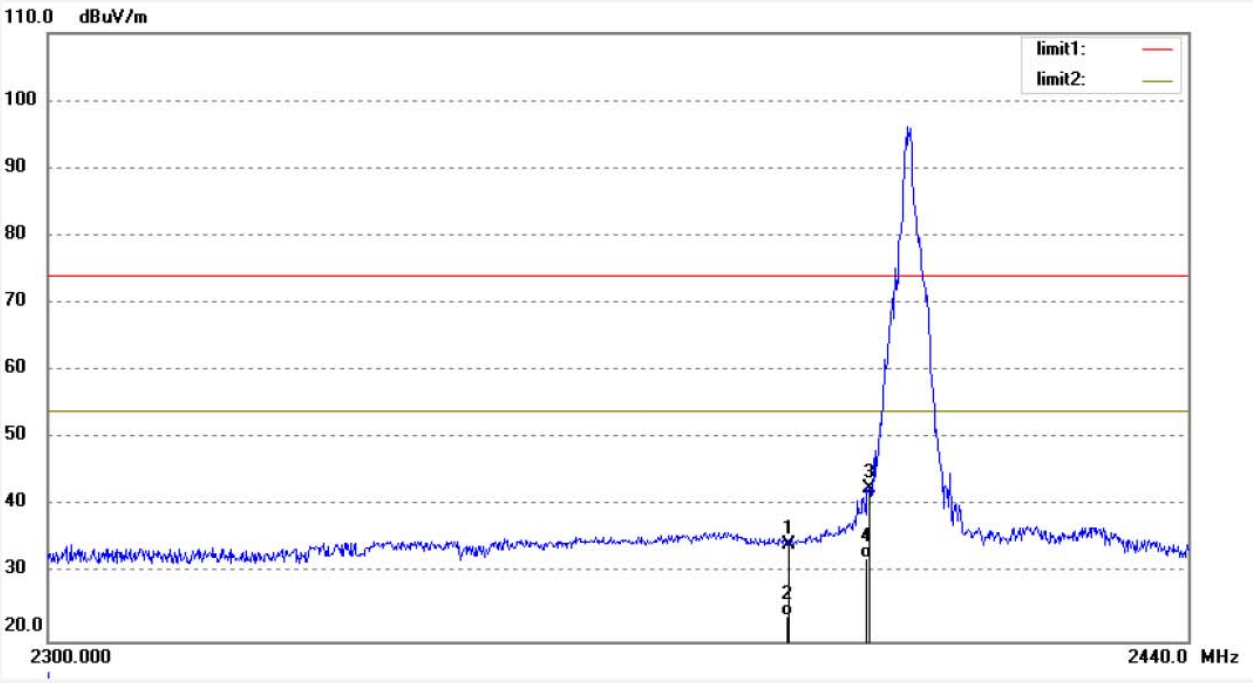
Job No.: FRANK2019 #1600	Polarization: Vertical
Standard: FCC PK	Power Source: DC 6V
Test item: Radiation Test	Date: 19/10/09/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 9/51/47
EUT: RC4WD 3-Channel 2.4GHz Transmitter	Engineer Signature:
Mode: TX 2405MHz	Distance: 3m
Model: Z-R0009	
Manufacturer: Shenzhen Shi Niu Model Co., Ltd.	

Note: Report NO.:ATE20191471



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2390.000	40.69	-6.32	34.37	74.00	-39.63	peak	150	193	
2	2390.000	30.12	-6.32	23.80	54.00	-30.20	AVG	150	92	
3	2400.000	48.81	-6.27	42.54	74.00	-31.46	peak	150	216	
4	2400.000	38.49	-6.27	32.22	54.00	-21.78	AVG	150	357	

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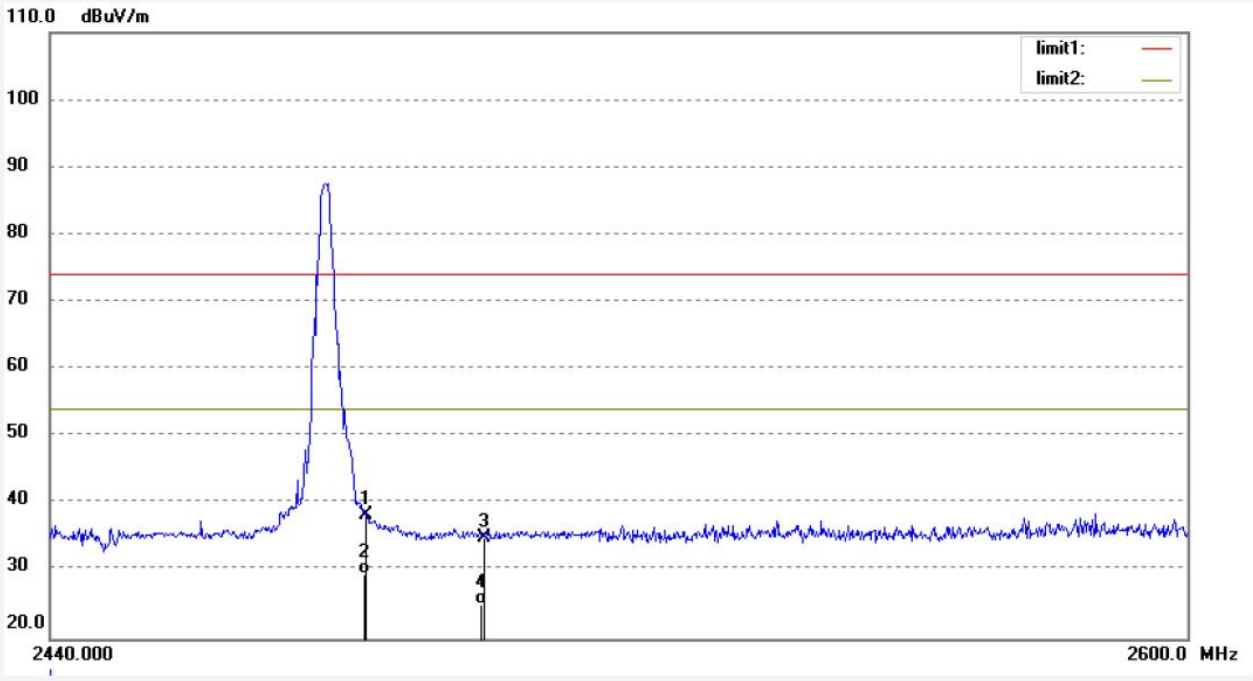
Job No.: FRANK2019 #1598	Polarization: Horizontal
Standard: FCC PK	Power Source: DC 6V
Test item: Radiation Test	Date: 19/10/09/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 9/47/51
EUT: RC4WD 3-Channel 2.4GHz Transmitter	Engineer Signature:
Mode: TX 2478MHz	Distance: 3m
Model: Z-R0009	
Manufacturer: Shenzhen Shi Niu Model Co., Ltd.	

Note: Report NO.:ATE20191471



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.500	44.27	-5.89	38.38	74.00	-35.62	peak	200	84	
2	2483.500	35.42	-5.89	29.53	54.00	-24.47	AVG	200	215	
3	2500.000	40.80	-5.81	34.99	74.00	-39.01	peak	200	62	
4	2500.000	30.79	-5.81	24.98	54.00	-29.02	AVG	200	193	

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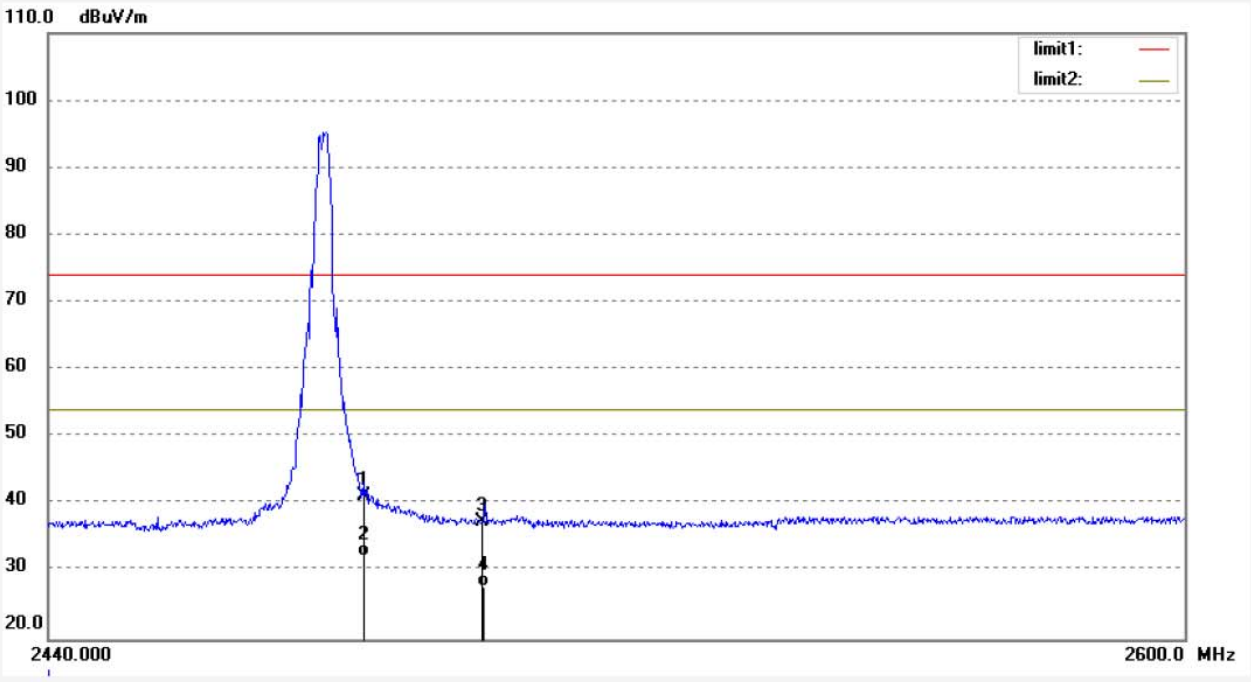
Job No.: FRANK2019 #1597	Polarization: Vertical
Standard: FCC PK	Power Source: DC 6V
Test item: Radiation Test	Date: 19/10/09/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 9/46/23
EUT: RC4WD 3-Channel 2.4GHz Transmitter	Engineer Signature:
Mode: TX 2478MHz	Distance: 3m
Model: Z-R0009	
Manufacturer: Shenzhen Shi Niu Model Co., Ltd.	

Note: Report NO.:ATE20191471



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.500	47.16	-5.89	41.27	74.00	-32.73	peak	150	193	
2	2483.500	38.15	-5.89	32.26	54.00	-21.74	AVG	150	33	
3	2500.000	43.22	-5.81	37.41	74.00	-36.59	peak	150	218	
4	2500.000	33.54	-5.81	27.73	54.00	-26.27	AVG	150	82	

Note:

1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is as follows:

   Result = Reading + Corrected Factor

9. RADIATED SPURIOUS EMISSION TEST

9.1.Block Diagram of Test Setup

9.1.1. Block diagram of connection between the EUT and peripherals

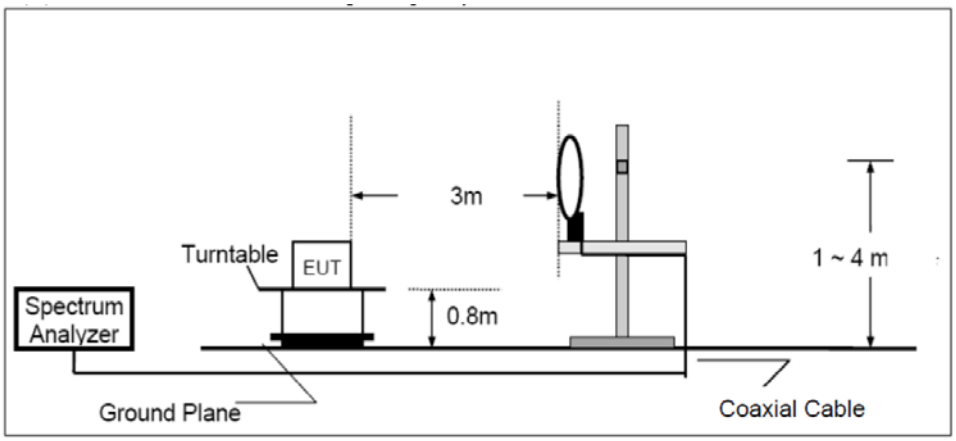
EUT

Figure 1 Setup: Transmitting mode

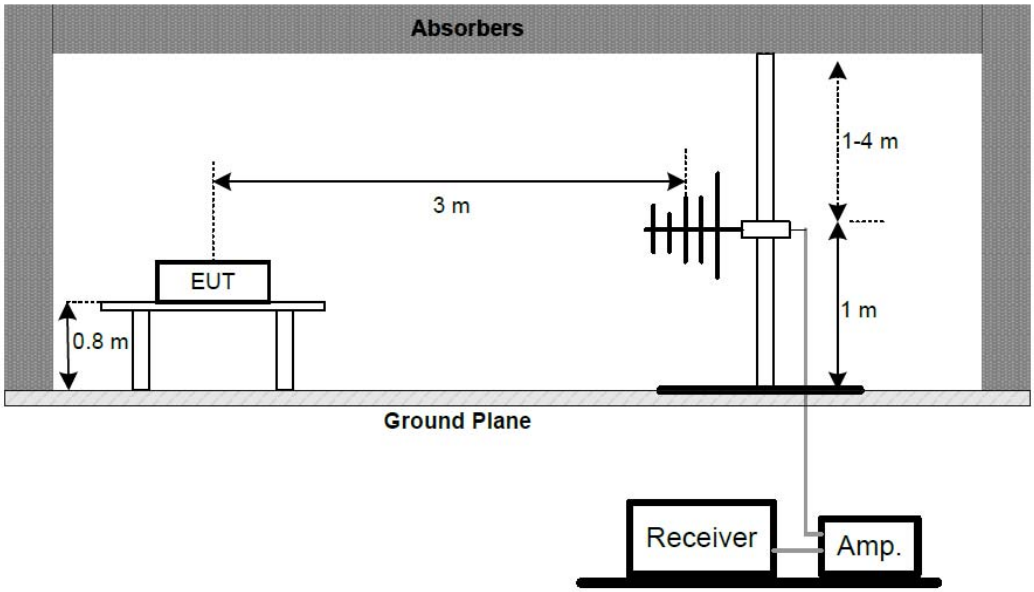
(EUT: RC4WD 3-Channel 2.4GHz Transmitter)

9.1.2.Semi-Anechoic Chamber Test Setup Diagram

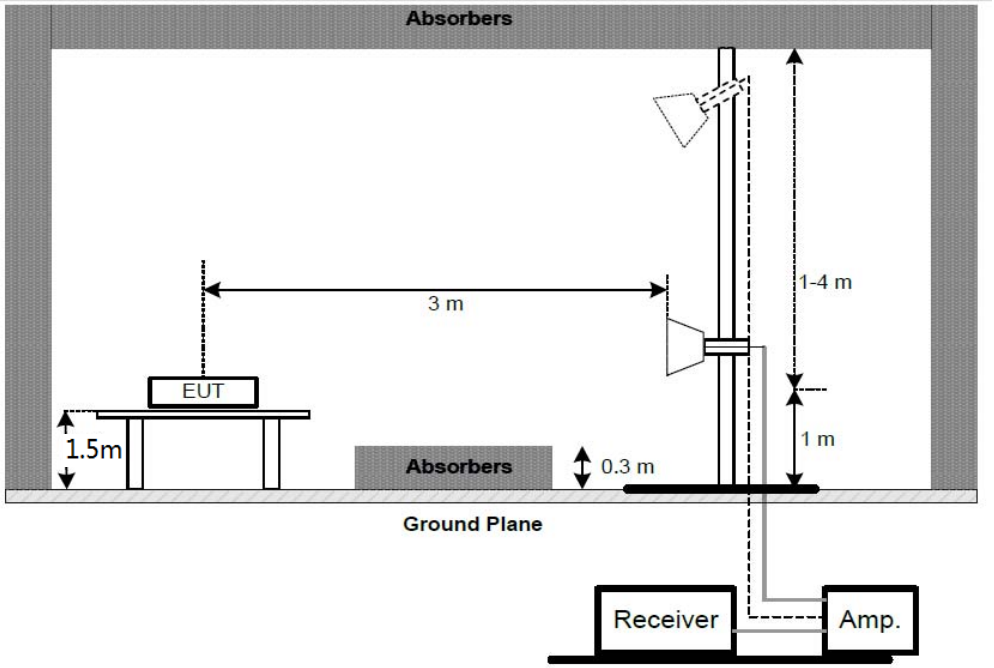
(A) Radiated Emission Test Set-Up, Frequency below 30MHz



(B) Radiated Emission Test Set-Up, Frequency below 1GHz



(C) Radiated Emission Test Set-Up, Frequency Above 1GHz



9.2. The Limit For Section 15.247(d)

Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

9.3. Restricted bands of operation

9.3.1. FCC Part 15.205 Restricted bands of operation

(a) Except as shown in paragraph (d) of this section, Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	([2])
13.36-13.41			

[1]Until February 1, 1999, this restricted band shall be 0.490-0.510
[2]Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emission appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000MHz, Compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, compliance with the emission limits in Section15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

9.4. Configuration of EUT on Measurement

The equipment are installed on Radiated Emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

9.5. Operating Condition of EUT

9.5.1. Setup the EUT and simulator as shown as Section 9.1.

9.5.2. Turn on the power of all equipment.

9.5.3. Let the EUT work in TX modes measure it. The transmit frequency range is 2405-2478MHz. We select 2405MHz, 2441MHz, and 2478MHz TX frequency to transmit.

9.6. Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground(Below 1GHz). The EUT and its simulators are placed on a turntable, which is 1.5 meter high above ground(Above 1GHz). The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bi-log antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the EUT location must be manipulated according to ANSI C63.10:2013 on radiated emission measurement. The EUT was tested in 3 orthogonal planes.

The bandwidth of test receiver is set at 9 kHz in below 30MHz. and set at 120 kHz in 30-1000MHz, and 1MHz in above 1000MHz.

The frequency range from 9 kHz to 25GHz is checked.
The final measurement in band 9-90 kHz, 110-490 kHz and above 1000MHz is performed with Average detector. Except those frequency bands mention above, the final measurement for frequencies below 1000MHz is performed with Quasi Peak detector.
The field strength is calculated by adding the antenna factor, and cable loss, and subtracting the amplifier gain from the measured reading. The basic equation calculation is as follows:
Result = Reading + Corrected Factor
Where Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

9.7.Data Sample

Frequency (MHz)	Reading (dBμv)	Factor (dB/m)	Result (dBμv/m)	Limit (dBμv/m)	Margin (dB)	Remark
X.XX	28.66	-15.19	13.47	40.0	-26.53	QP

Frequency(MHz) = Emission frequency in MHz
Reading(dBμv) = Uncorrected Analyzer/Receiver reading
Factor (dB/m) = Antenna factor + Cable Loss – Amplifier gain
Result(dBμv/m) = Reading(dBμv) + Factor(dB/m)
Limit (dBμv/m) = Limit stated in standard
Margin (dB) = Result(dBμv/m) - Limit (dBμv/m)
QP = Quasi-peak Reading

Calculation Formula:
Margin(dB) = Result (dBμV/m)–Limit(dBμV/m)
Result(dBμV/m)= Reading(dBμV)+ Factor(dB/m)

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the limit.

9.8.The Field Strength of Radiation Emission Measurement Results

PASS.

Note: 1. Emissions attenuated more than 20 dB below the permissible value are not reported.

2. *: Denotes restricted band of operation.

3. The radiation emissions from 9kHz-30MHz and 18-25GHz are not reported, because the test values lower than the limits of 20dB.

Below 1GHz

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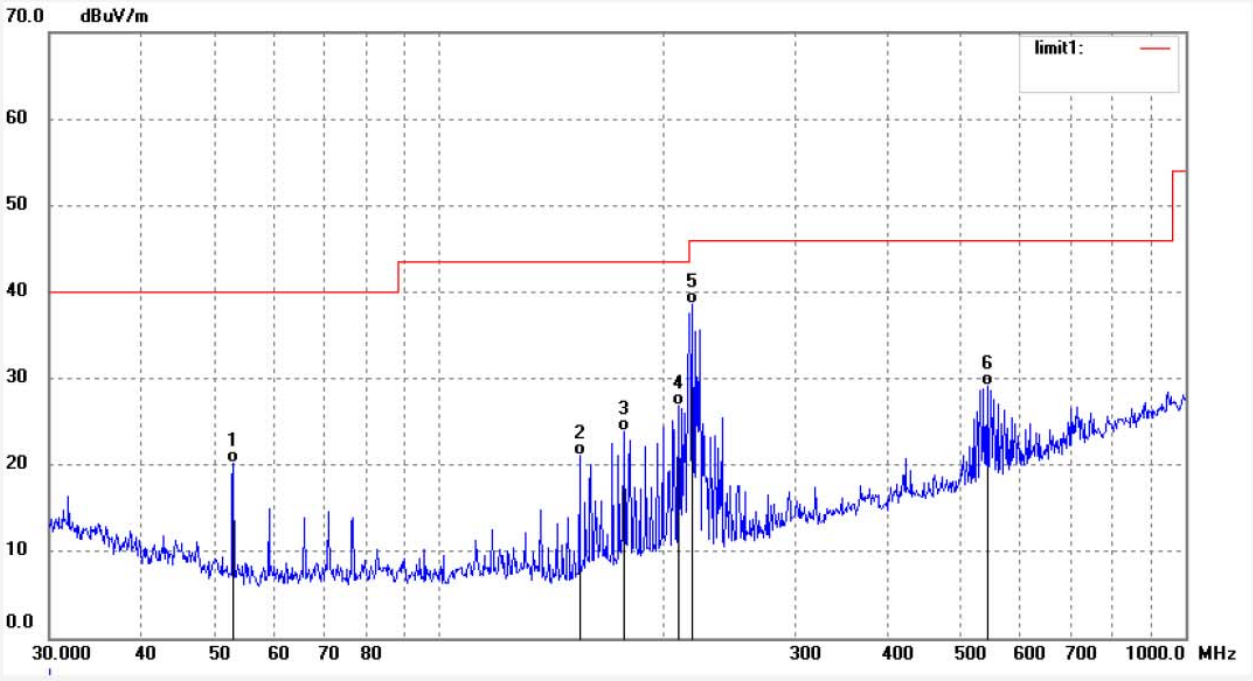
Job No.: FRANK2019 #1580	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: DC 6V
Test item: Radiation Test	Date: 19/10/09/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 9/04/41
EUT: RC4WD 3-Channel 2.4GHz Transmitter	Engineer Signature:
Mode: TX 2405MHz	Distance: 3m
Model: Z-R0009	
Manufacturer: Shenzhen Shi Niu Model Co., Ltd.	

Note: Report NO.:ATE20191471



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	53.0056	46.84	-26.69	20.15	40.00	-19.85	QP	200	102	
2	154.2427	48.77	-27.68	21.09	43.50	-22.41	QP	200	256	
3	176.8951	50.23	-26.33	23.90	43.50	-19.60	QP	200	93	
4	209.3924	50.92	-24.12	26.80	43.50	-16.70	QP	200	159	
5	218.4096	62.63	-24.03	38.60	46.00	-7.40	QP	200	55	
6	542.6104	44.20	-15.03	29.17	46.00	-16.83	QP	200	32	

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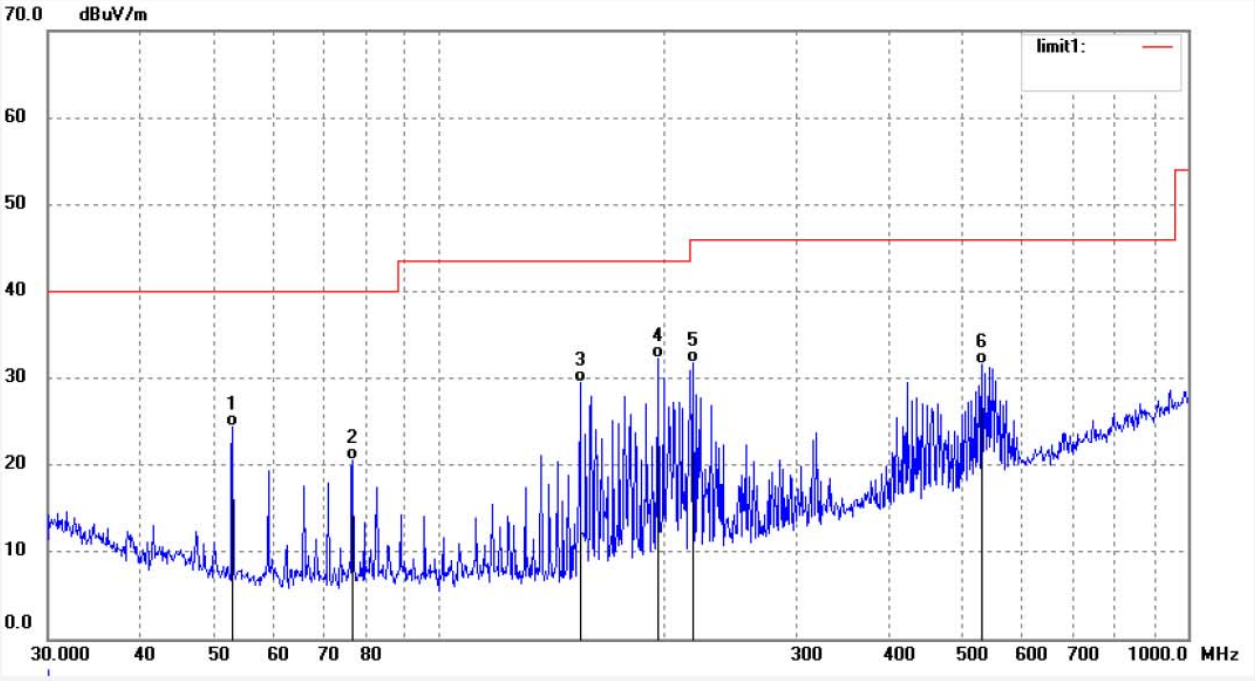
Job No.: FRANK2019 #1579	Polarization: Vertical
Standard: FCC Class B 3M Radiated	Power Source: DC 6V
Test item: Radiation Test	Date: 19/10/09/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 9/02/37
EUT: RC4WD 3-Channel 2.4GHz Transmitter	Engineer Signature:
Mode: TX 2405MHz	Distance: 3m
Model: Z-R0009	
Manufacturer: Shenzhen Shi Niu Model Co., Ltd.	

Note: Report NO.:ATE20191471



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	53.0056	51.08	-26.69	24.39	40.00	-15.61	QP	100	319	
2	76.6556	48.11	-27.60	20.51	40.00	-19.49	QP	100	57	
3	154.2427	57.25	-27.68	29.57	43.50	-13.93	QP	100	224	
4	195.8701	56.89	-24.59	32.30	43.50	-11.20	QP	100	246	
5	218.4096	55.86	-24.03	31.83	46.00	-14.17	QP	100	25	
6	531.2910	47.00	-15.37	31.63	46.00	-14.37	QP	100	103	

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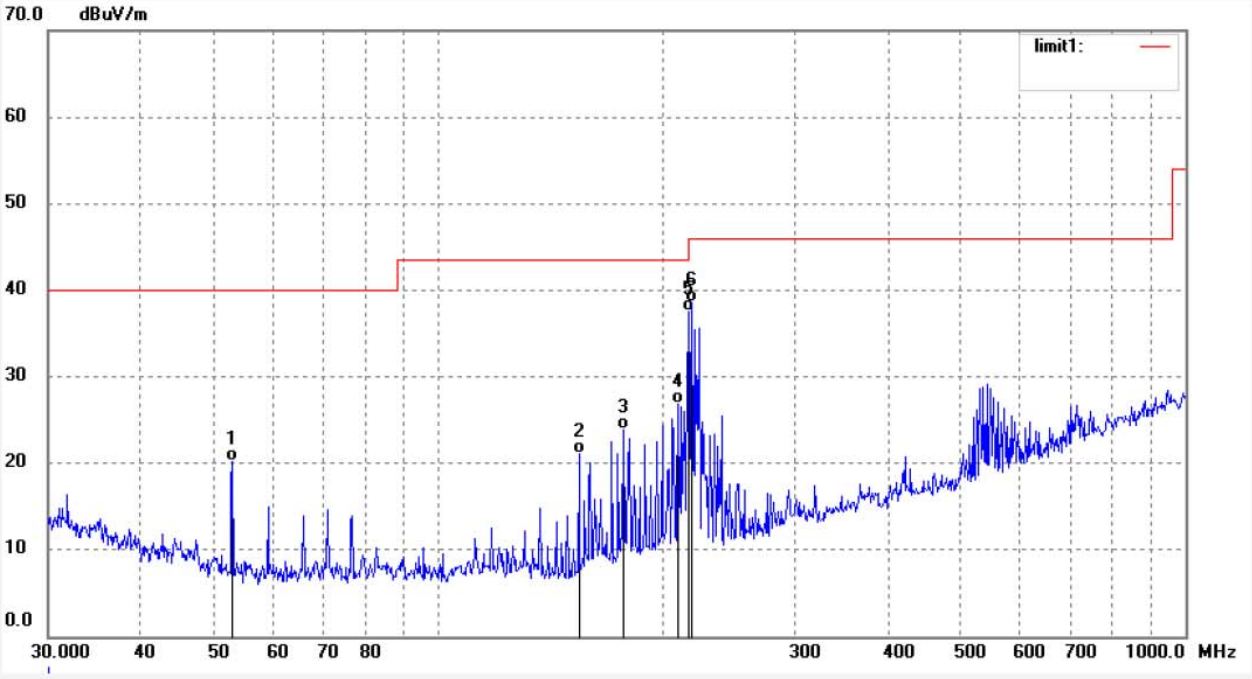
Job No.: FRANK2019 #1581	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: DC 6V
Test item: Radiation Test	Date: 19/10/09/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 9/04/50
EUT: RC4WD 3-Channel 2.4GHz Transmitter	Engineer Signature:
Mode: TX 2441MHz	Distance: 3m
Model: Z-R0009	
Manufacturer: Shenzhen Shi Niu Model Co., Ltd.	

Note: Report NO.:ATE20191471



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	53.0056	46.84	-26.69	20.15	40.00	-19.85	QP	200	327	
2	154.2427	48.77	-27.68	21.09	43.50	-22.41	QP	200	49	
3	176.8951	50.23	-26.33	23.90	43.50	-19.60	QP	200	85	
4	209.3924	50.92	-24.12	26.80	43.50	-16.70	QP	200	279	
5	216.1195	61.50	-24.05	37.45	46.00	-8.55	QP	200	246	
6	218.4096	62.63	-24.03	38.60	46.00	-7.40	QP	200	103	

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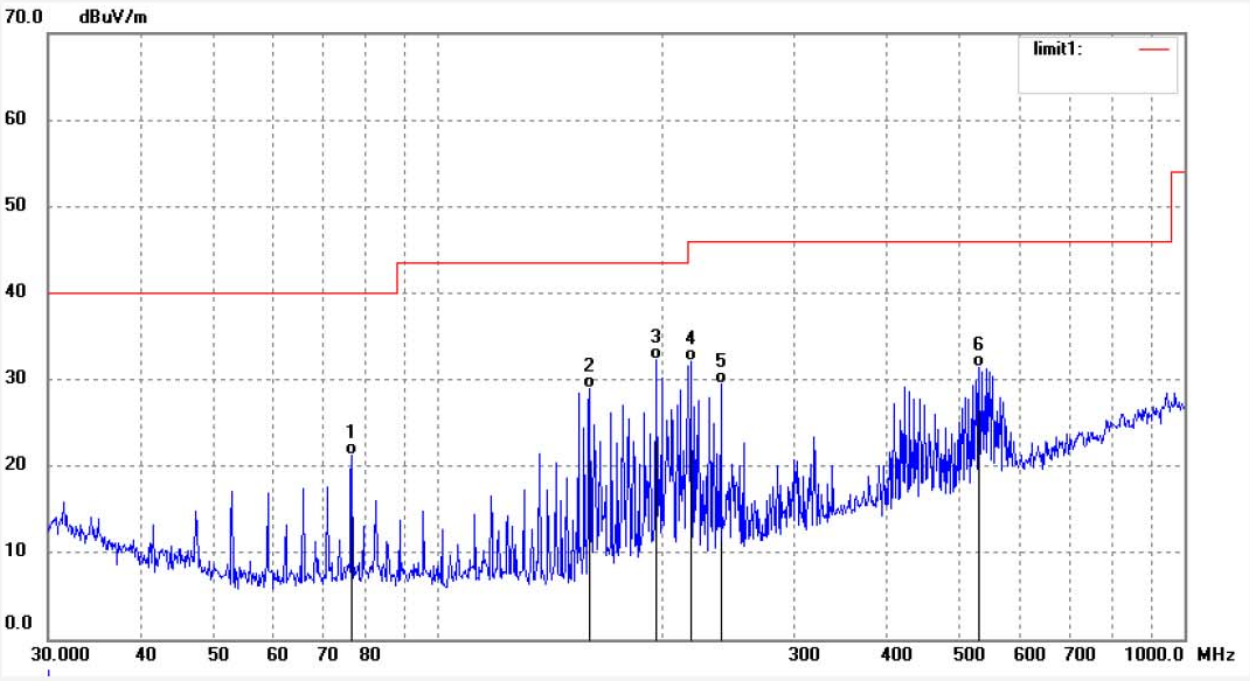
Job No.: FRANK2019 #1582
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: RC4WD 3-Channel 2.4GHz Transmitter
Mode: TX 2441MHz
Model: Z-R0009
Manufacturer: Shenzhen Shi Niu Model Co., Ltd.

Polarization: Vertical
Power Source: DC 6V
Date: 19/10/09/
Time: 9/06/28
Engineer Signature:
Distance: 3m

Note: Report NO.:ATE20191471



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	76.6556	48.87	-27.60	21.27	40.00	-18.73	QP	100	328	
2	159.7586	56.06	-27.09	28.97	43.50	-14.53	QP	100	179	
3	195.8701	56.90	-24.59	32.31	43.50	-11.19	QP	100	65	
4	218.4096	56.20	-24.03	32.17	46.00	-13.83	QP	100	42	
5	239.3017	53.14	-23.73	29.41	46.00	-16.59	QP	100	215	
6	531.2910	46.75	-15.37	31.38	46.00	-14.62	QP	100	193	

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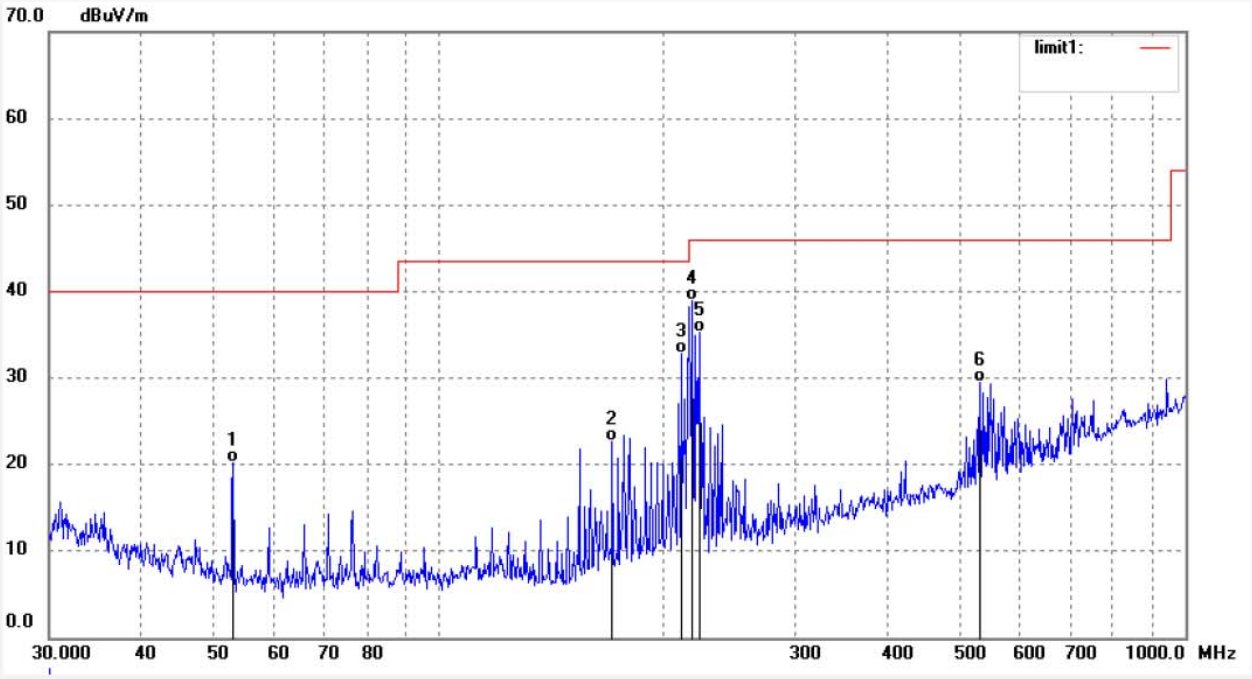
Job No.: FRANK2019 #1584
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: RC4WD 3-Channel 2.4GHz Transmitter
Mode: TX 2478MHz
Model: Z-R0009
Manufacturer: Shenzhen Shi Niu Model Co., Ltd.

Polarization: Horizontal
Power Source: DC 6V
Date: 19/10/09/
Time: 9/07/37
Engineer Signature:
Distance: 3m

Note: Report NO.:ATE20191471



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	53.0056	46.95	-26.69	20.26	40.00	-19.74	QP	200	103	
2	170.7878	48.70	-26.08	22.62	43.50	-20.88	QP	200	22	
3	210.8688	56.90	-24.10	32.80	43.50	-10.70	QP	200	93	
4	218.4096	62.98	-24.03	38.95	46.00	-7.05	QP	200	115	
5	223.0629	59.24	-23.96	35.28	46.00	-10.72	QP	200	61	
6	531.2910	44.86	-15.37	29.49	46.00	-16.51	QP	200	201	

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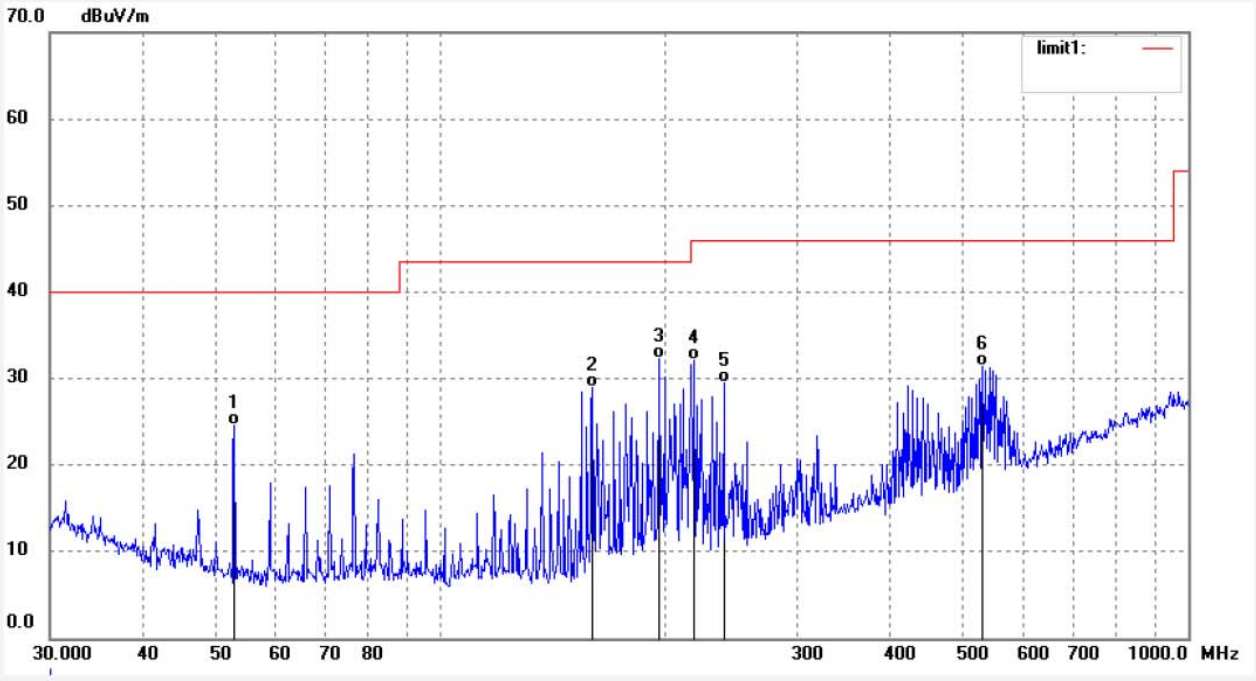
Job No.: FRANK2019 #1583	Polarization: Vertical
Standard: FCC Class B 3M Radiated	Power Source: DC 6V
Test item: Radiation Test	Date: 19/10/09/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 9/06/37
EUT: RC4WD 3-Channel 2.4GHz Transmitter	Engineer Signature:
Mode: TX 2478MHz	Distance: 3m
Model: Z-R0009	
Manufacturer: Shenzhen Shi Niu Model Co., Ltd.	

Note: Report NO.:ATE20191471



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	53.0056	51.23	-26.69	24.54	40.00	-15.46	QP	100	52	
2	159.7586	56.06	-27.09	28.97	43.50	-14.53	QP	100	221	
3	195.8701	56.90	-24.59	32.31	43.50	-11.19	QP	100	93	
4	218.4096	56.20	-24.03	32.17	46.00	-13.83	QP	100	218	
5	239.3017	53.14	-23.73	29.41	46.00	-16.59	QP	100	163	
6	531.2910	46.75	-15.37	31.38	46.00	-14.62	QP	100	93	

Above 1GHz

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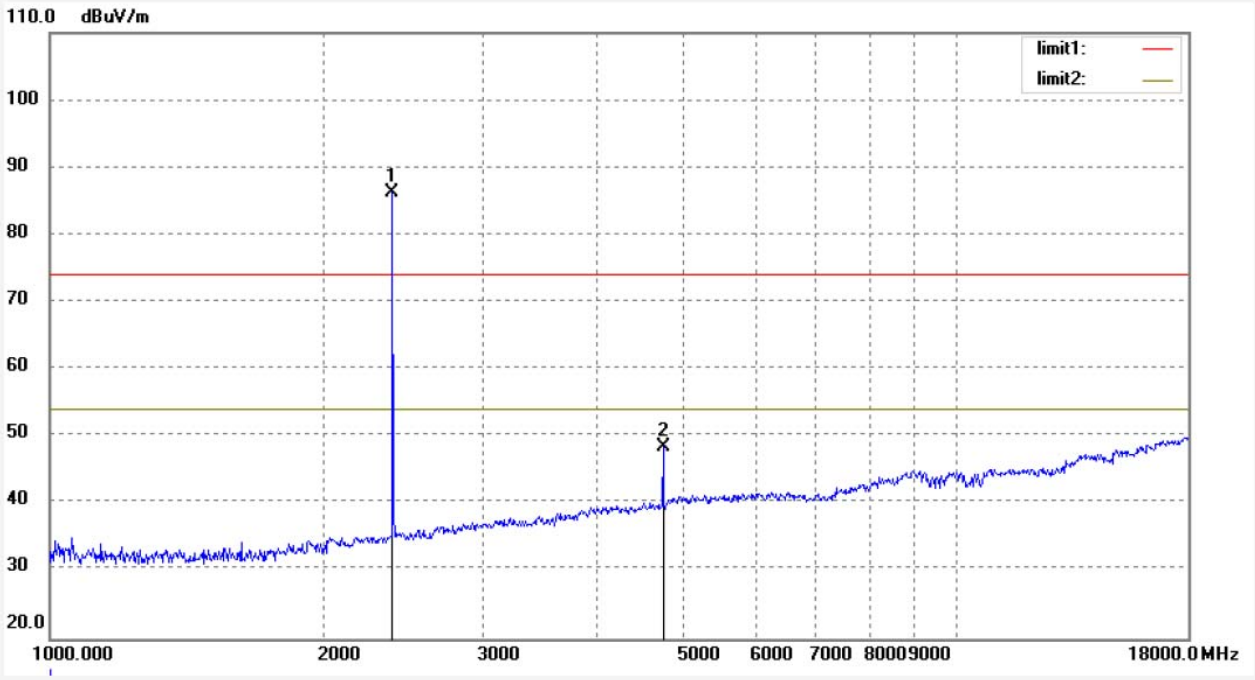
Job No.: FRANK2019 #1594	Polarization: Horizontal
Standard: FCC PK	Power Source: DC 6V
Test item: Radiation Test	Date: 19/10/09/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 9/29/31
EUT: RC4WD 3-Channel 2.4GHz Transmitter	Engineer Signature:
Mode: TX 2405MHz	Distance: 3m
Model: Z-R0009	
Manufacturer: Shenzhen Shi Niu Model Co., Ltd.	

Note: Report NO.:ATE20191471



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2405.359	92.58	-6.33	86.25	/	/	peak	200	18	
2	4810.751	47.78	0.76	48.54	74.00	-25.46	peak	200	214	

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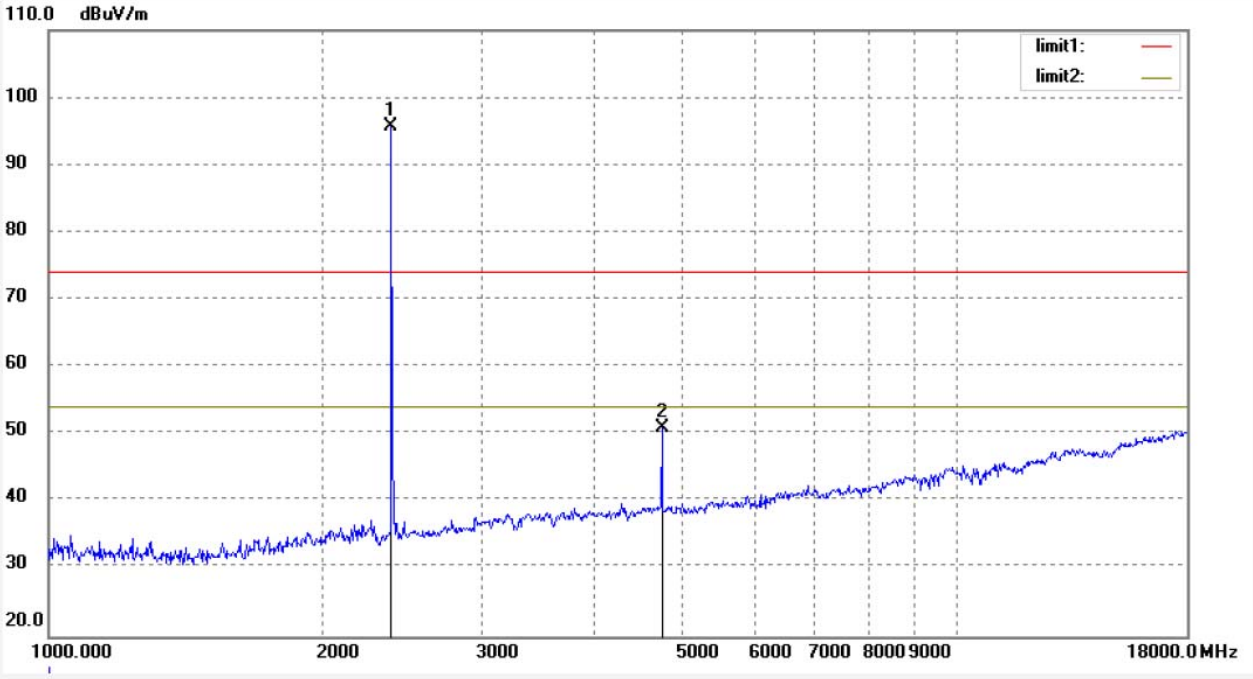
Job No.: FRANK2019 #1591	Polarization: Vertical
Standard: FCC PK	Power Source: DC 6V
Test item: Radiation Test	Date: 19/10/09/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 9/29/31
EUT: RC4WD 3-Channel 2.4GHz Transmitter	Engineer Signature:
Mode: TX 2405MHz	Distance: 3m
Model: Z-R0009	
Manufacturer: Shenzhen Shi Niu Model Co., Ltd.	

Note: Report NO.:ATE20191471



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2405.359	102.08	-6.33	95.75	/	/	peak	150	199	
2	4810.751	50.28	0.76	51.04	74.00	-22.96	peak	150	331	

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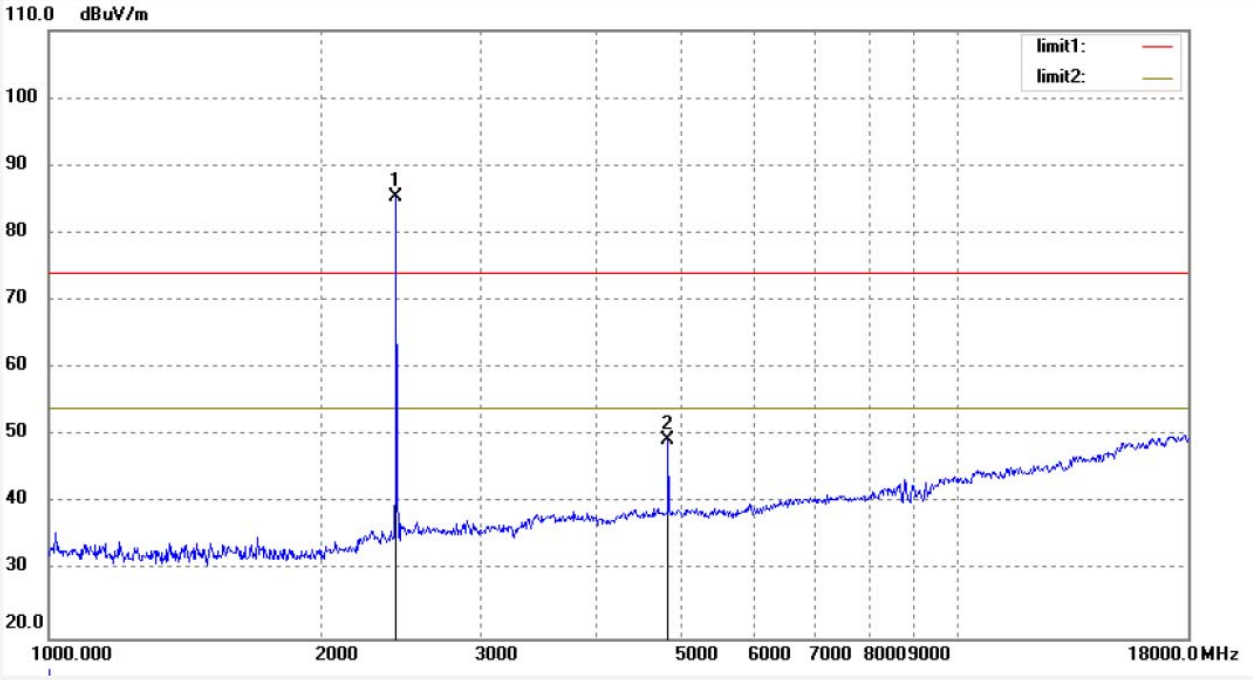
Job No.: FRANK2019 #1593	Polarization: Horizontal
Standard: FCC PK	Power Source: DC 6V
Test item: Radiation Test	Date: 19/10/09/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 9/32/53
EUT: RC4WD 3-Channel 2.4GHz Transmitter	Engineer Signature:
Mode: TX 2441MHz	Distance: 3m
Model: Z-R0009	
Manufacturer: Shenzhen Shi Niu Model Co., Ltd.	

Note: Report NO.:ATE20191471



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2441.121	91.66	-6.20	85.46	/	/	peak	200	215	
2	4882.324	48.37	1.07	49.44	74.00	-24.56	peak	250	163	

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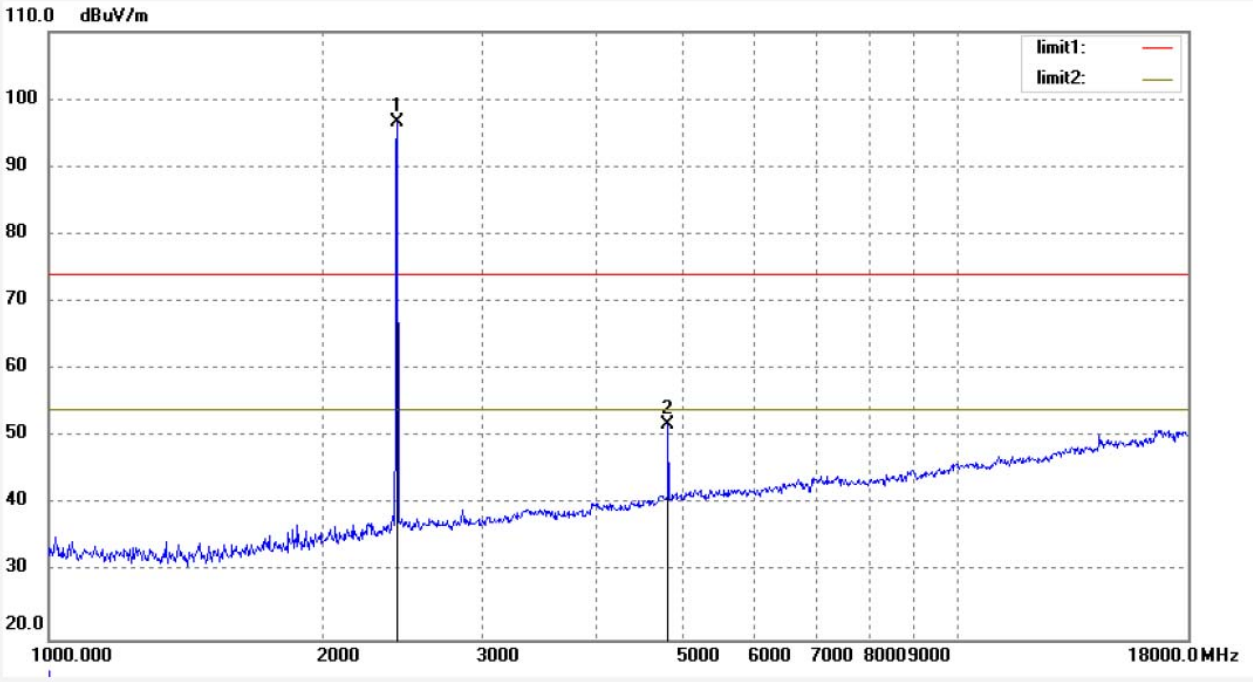
Job No.: FRANK2019 #1592	Polarization: Vertical
Standard: FCC PK	Power Source: DC 6V
Test item: Radiation Test	Date: 19/10/09/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 9/31/24
EUT: RC4WD 3-Channel 2.4GHz Transmitter	Engineer Signature:
Mode: TX 2441MHz	Distance: 3m
Model: Z-R0009	
Manufacturer: Shenzhen Shi Niu Model Co., Ltd.	

Note: Report NO.:ATE20191471



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2441.162	102.85	-6.17	96.68			peak	150	21	
2	4882.324	50.80	1.07	51.87	74.00	-22.13	peak	150	193	

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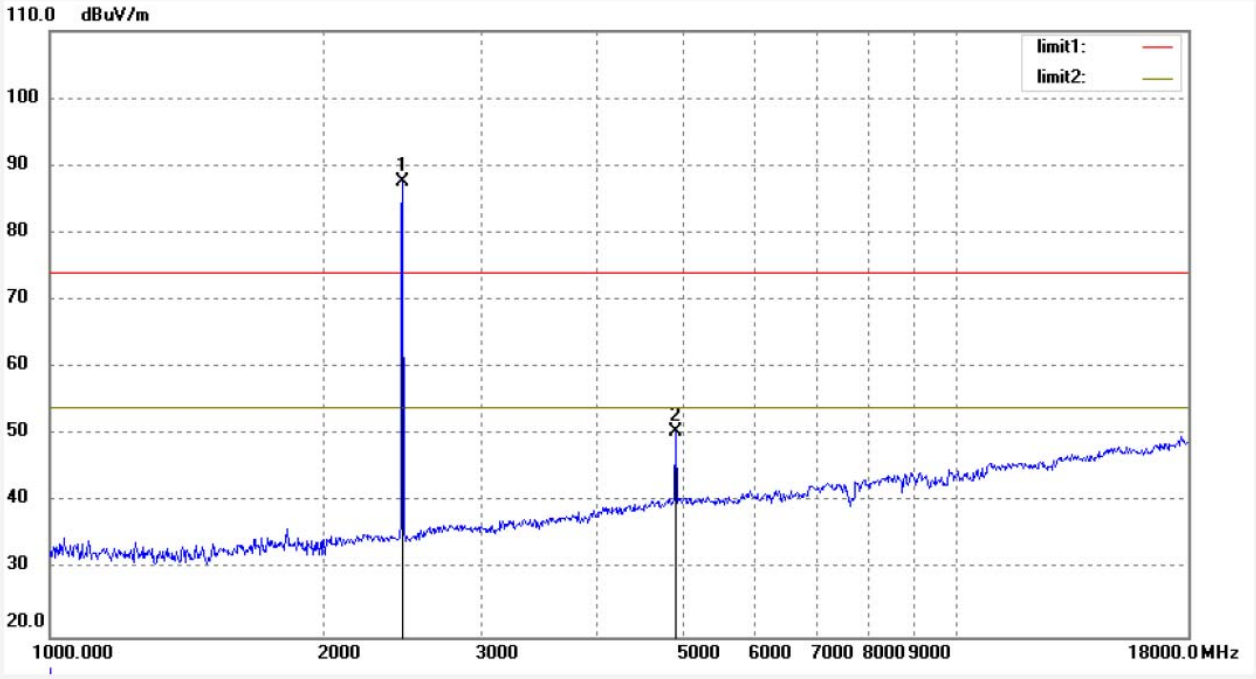
Job No.: FRANK2019 #1595
Standard: FCC PK
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: RC4WD 3-Channel 2.4GHz Transmitter
Mode: TX 2478MHz
Model: Z-R0009
Manufacturer: Shenzhen Shi Niu Model Co., Ltd.

Polarization: Horizontal
Power Source: DC 6V
Date: 19/10/09/
Time: 9/35/48
Engineer Signature:
Distance: 3m

Note: Report NO.:ATE20191471



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2478.034	93.65	-6.04	87.61			peak	200	193	
2	4956.160	49.15	1.43	50.58	74.00	-23.42	peak	200	54	

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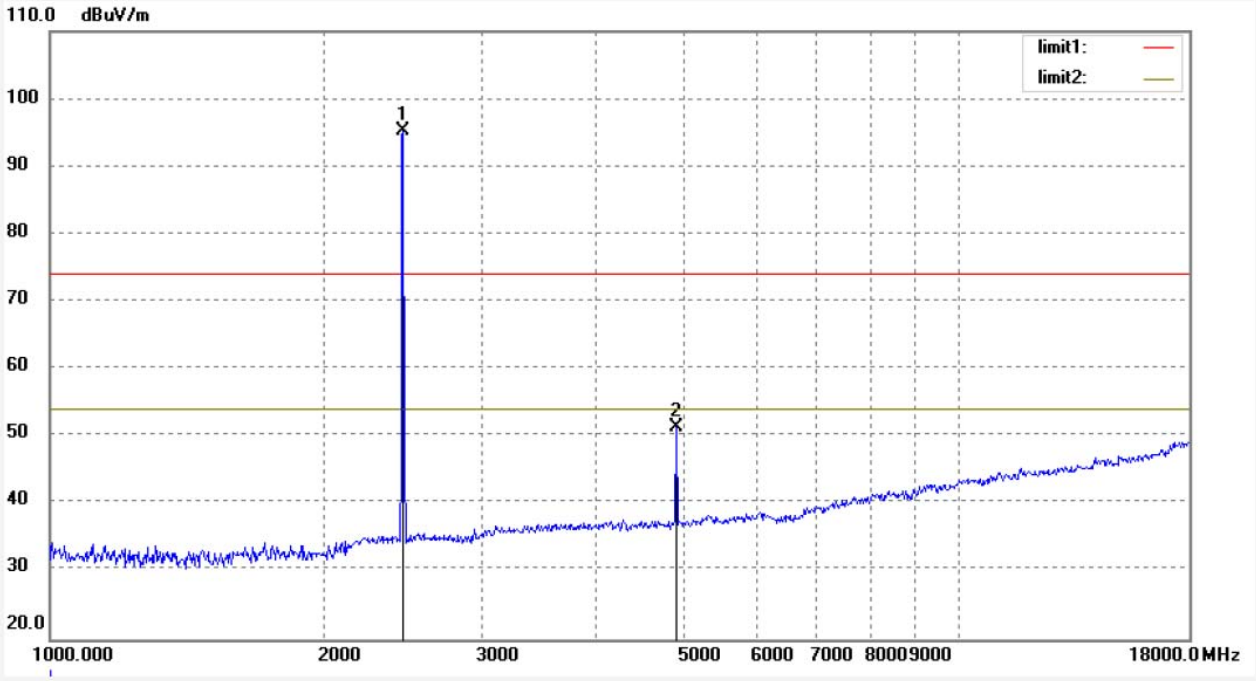
Job No.: FRANK2019 #1596	Polarization: Vertical
Standard: FCC PK	Power Source: DC 6V
Test item: Radiation Test	Date: 19/10/09/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 9/37/14
EUT: RC4WD 3-Channel 2.4GHz Transmitter	Engineer Signature:
Mode: TX 2478MHz	Distance: 3m
Model: Z-R0009	
Manufacturer: Shenzhen Shi Niu Model Co., Ltd.	

Note: Report NO.:ATE20191471



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2478.034	101.28	-6.04	95.24			peak	150	193	
2	4956.160	49.93	1.43	51.36	74.00	-22.64	peak	150	40	

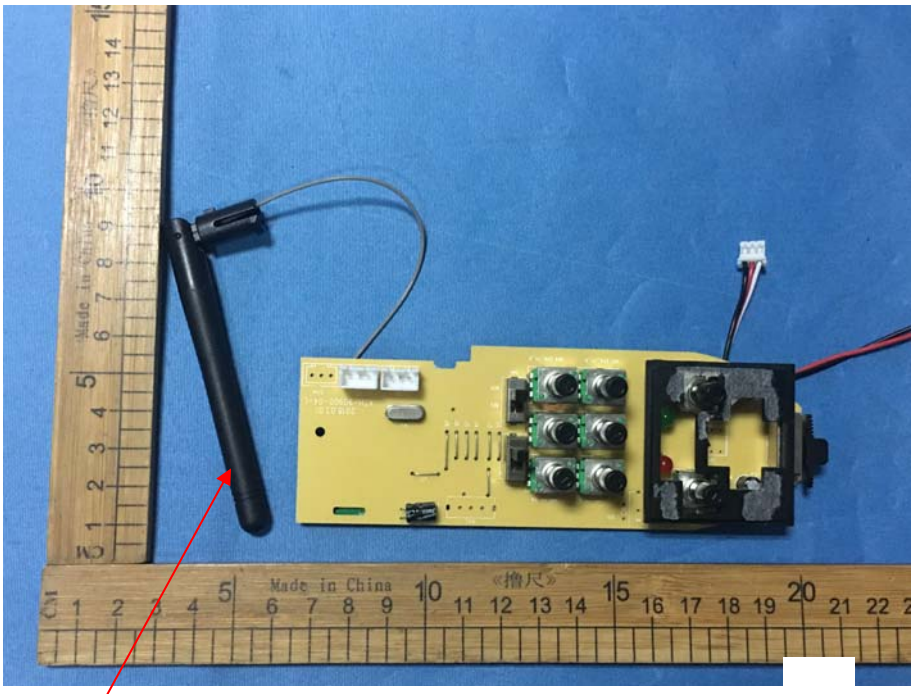
10. ANTENNA REQUIREMENT

10.1. The Requirement

According to Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

10.2. Antenna Construction

Device is equipped with permanent attached antenna, which isn't displaced by other antenna. The Antenna gain of EUT is 2.5dBi. Therefore, the equipment complies with the antenna requirement of Section 15.203.



Antenna